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ABSTRACT

Results of a followup employment survey of 1979 physics and astronomy graduates are summarized. The employment-oriented graduates were asked in the winter of 1979-80 to describe their positions and comment on the extent to which they were satisfied with the start of their careers. Data on how long it takes a graduate to secure initial and potentially permanent employment indicates that the demand for physics degree recipients has increased at all degree levels. Changes in occupational status of new physics and astronomy graduates over a six-month period are indicated, and characteristics of employed physicists and astronomers who have doctorates are specified. The subfield chosen for the dissertation appears to influence the type of employment more than any of the other characteristics; less influential but noteworthy characteristics appear to be citizenship and age. Information is also provided on factors influencing the length of postdoctoral fellowships for 1978-79 doctoral-level physicists, employers of doctoral graduates who accepted potentially permanent positions, background characteristics and the employment status of 1978-79 masters degree recipients, and the time spent by employed masters to secure their initial employment. The data indicate that older graduates and those from master's institutions secure positions faster, and that there is a demand for teachers. Characteristics of bachelors-level physics graduates that influence the time required to secure employment, and the jobs obtained by bachelors-level astronomy graduates are also indicated. (SW)

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AIP report

MANPOWER STATISTICS DIVISION

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EMPLOYMENT SURVEY 1979

by Susanne D. Ellis

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A major objective of the surveys AIP conducts each year is the evaluation of employment opportunities for physics and astronomy graduates at the three degree levels: bachelor's, master's, and doctor's. Two surveys are conducted each summer which include questions concerning initial employment; however, these questions primarily concentrate on postbaccalaureate plans. To obtain a more detailed and accurate assessment of initial employment a follow-up survey is conducted in December of each year of those graduates who indicated an interest in, or acceptance of employment.

The follow-up Employment Survey summarized in this report was conducted during the winter of 1979–80; employment-oriented graduates of the class of 1979 were asked to describe their positions and comment on the extent to which they were satisfied with the start of their careers. Highlights of this report are:

1) A higher proportion than in previous years, of the physics bachelors and doctors had secured positions prior to graduation.
2) A shift toward longer 'postdocs'; only 36% compared with 48% in the previous year, accepted 'postdocs' for one year or less.
3) Only 1% of the doctoral physicists and 3% of the nondoctoral physicists were unemployed and seeking employment, 6–18 months after graduation.

Figure I addresses itself to the question of how long does it take a graduate to secure initial employment which he or she can classify as potentially permanent; for that reason 'postdocs' are excluded from **Figure I** as noted in its key. When compared with the previous year's data, the first set of bars, which refers to graduates with positions lined up, shows that the demand for physics degree recipients has increased; in particular, an increase for the doctors to 23% from 16% and that for the bachelors to 56% from 35% represent dramatic changes from the previous year. Doctoral graduates who took more than six months to accept a permanent position remained at approximately 10%.

Fig. I. Time spent by 1978–79 physics degree recipients in securing employment.

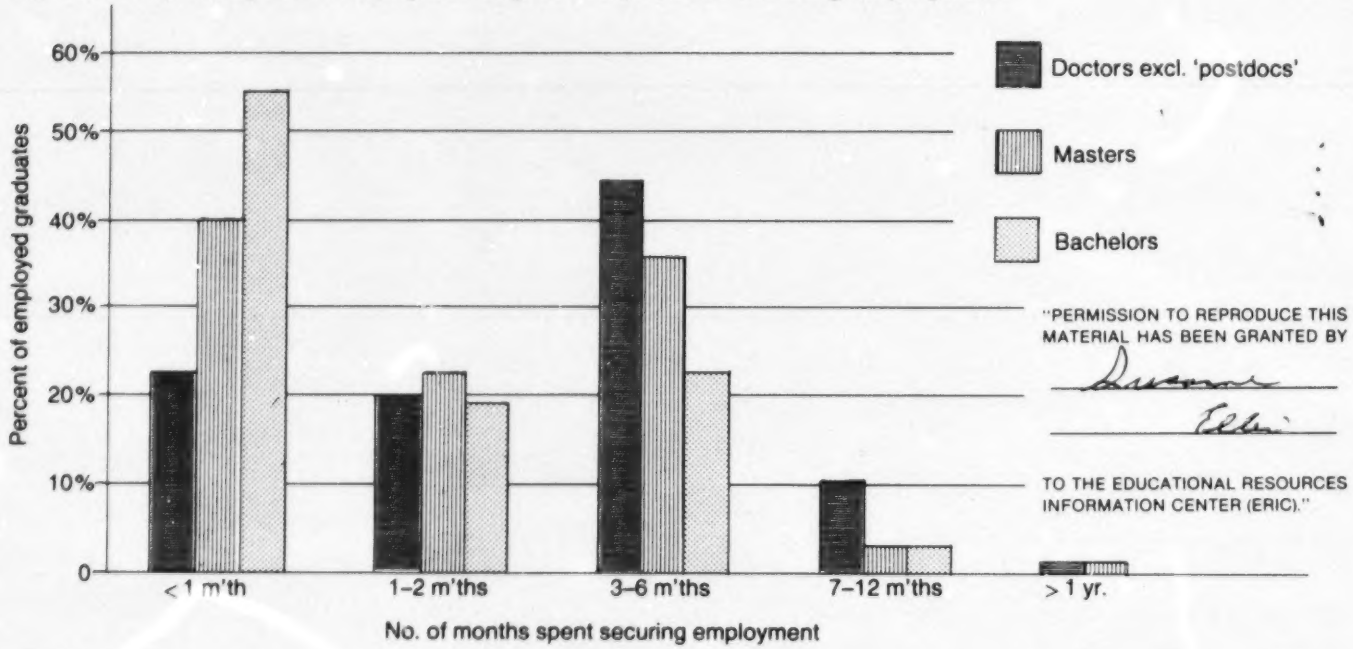

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Table I. Changes in occupational status of physics degree recipients between the summer of 1979 and the following winter.

Employment status reported by physics degree recipients, summer 1979

Doctorate recipients		Occupational status, winter 1979–80 'Postdocs' or students	Full-time employed	Employed p-t temp., other	Not empl. and seeking	Total N	Total %
Newly accepted empl.		32	132	–	–	164	40
Continuing employment		10	52	–	1	63	15
'Postdoc'		134	17	–	2	153	37
No immediate plans		–	1	–	–	1	–
Not empl. and seeking		9	22	–	3	34	8
Total	N	185	224	–	6	415	
	%	45	54	–	1		100%
Masters							
Newly accepted empl.		3	77	5	2	87	55
Continuing employment		–	30	2	–	32	20
Career military		–	3	–	–	3	2
No immediate plans		–	2	2	–	4	3
Not empl. and seeking		–	26	3	2	31	20
Total	N	3	138	12	4	157	
	%	2	87	8	3		100%
Bachelors							
Newly accepted empl.		6	429	4	4	443	61
Continuing employment		2	61	3	1	67	9
Military service		1	72	1	–	74	10
Other (vol., temp.)		3	18	11	4	36	5
No immediate plans		–	6	5	2	13	2
Not empl. and seeking		3	74	11	9	97	13
Total	N	15	660	35	20	730	
	%	2	90	5	3		100%

Tables I and **II** highlight the change in occupational status of new graduates over a six-months period*. Each table includes all three degree levels with **Table I** presenting these changes for physicists and **Table II** for astronomers. Thus **Table I** shows how 8%, 20% and 13%, depicting the groups of graduates who were not employed and seeking in the summer of 1979, declined to 1%, 3%, and 3% respectively when contacted six months later. The total number of astronomy respondents at all three levels was 97 and all 17 degree recipients who sought employment at the time of the summer survey were employed six months later.

Table III singles out the employed doctorate recipients among the physicists and astronomers and presents five characteristics for each group that could be expected to influence the type of employment these scientists accepted; namely temporary postdoctoral fellowships or regular full-time employment. The subfield chosen for the dissertation appears to influence the type of employment more than any of the other characteristics. For example, high energy and nuclear physicists seem more likely candidates for 'postdocs' than for immediate permanent employment. Less influential but noteworthy appear to be citizenship and age: a higher proportion of foreign physics graduates are offered 'postdocs' than permanent positions, and 'postdocs' also appear to be somewhat younger.

*Although employment-oriented degree recipients from July 1978 through June 1979 are included, most of the respondents graduated in May or June 1979.

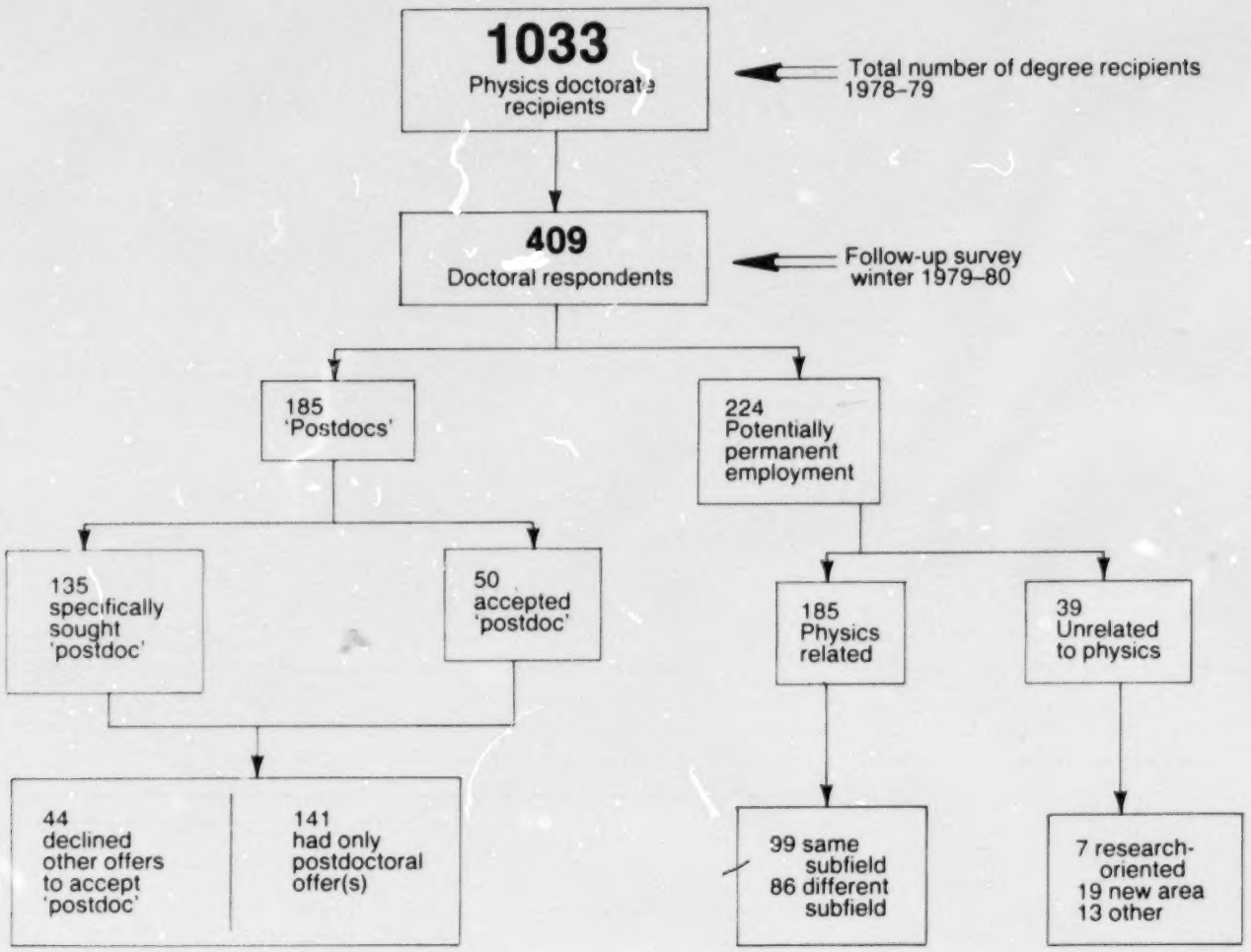
Table II. Changes in occupational status of astronomy degree recipients between the summer of 1979 and the following winter.

Employment status reported by astronomy degree recipients, summer 1979						
Doctorate recipients		'Postdoc'	Full-time employed	Employed p-t temp., other	Total N	%
Newly accepted empl.		3	11	–	14	29
Continuing employment		–	4	–	4	8
'Postdoc'		25	–	–	25	51
Not empl. and seeking		3	3	–	6	12
Total	N	31	18	–	49	
	%	63	37	–		100%
Masters						
Newly accepted empl.			9	–	9	64
Cont., incl. military			4	–	4	29
Not empl. and seeking			1	–	1	7
Total	N		14	–	14	
	%		100%	–	–	100%
Bachelors						
Newly accepted empl.			18	–	18	53
Cont., incl. military			3	–	3	9
Temporary empl.			3	–	3	9
Not empl. and seeking			9	1	10	29
Total	N		33	1	34	
	%		97	3		100%

Table III. Characteristics of postdoctoral and full-time employed physics and astronomy doctorate recipients, 1978–79.

	Physics		Astronomy		
Characteristics	'Postdocs'	Full-time employed	'Postdocs'	Full-time employed	Characteristics
Sex					**Sex**
Female	4%	6%	6%	6%	Female
Male	96	94	94	94	Male
Age					**Age**
26 or younger	15%	4%	10%	6%	26 or younger
27 yrs.	22	9	23	6	27 yrs.
28 yrs.	21	18	26	11	28 yrs.
29 yrs.	16	14	10	17	29 yrs.
30 yrs.	12	12	7	17	30 yrs.
31–32 yrs.	10	17	16	33	31–32 yrs.
33 or older	4	26	8	10	33 or older
Citizenship					**Citizenship**
U.S.	79%	87%	90%	89%	U.S.
Foreign	21	13	10	11	Foreign
Type of research					**Type of research**
Experimental	52%	54%	48%	45%	Observational
Theoretical	37	35	26	16	Theoretical
Both	11	11	26	39	Both
Major subfields					**Major subfields**
Astrophysics	8%	6%	3%	17%	Astronomical instruments and techniques
Electron, atomic & molec.	9	9	3	17	Astrophysics
Elem. particles	18	6	23	11	Cosmology, extragalactic, quasi-stellar objects
Math. physics	6	7	23	6	Interstellar matter and gaseous nebulae
Nuclear	17	9	10	6	Solar system, space astronomy of the solar system
Plasma	6	8	13	22	Stellar atmospheres and spectra, stellar evolution, solar and stellar interiors
Solid state	25	36	25	21	Other
Number of respondents	150	224	31	18	

Fig. II. Employment status of 1978–79 doctoral physicists 6–18 months after graduation.



Having distinguished between temporary and potentially permanent initial employment for physicists, we asked each group a different set of questions. **Figure II** summarizes the responses from both groups and shows that one quarter of the 'postdocs' declined offers with potential permanence in order to accept those temporary positions which usually offer lower salaries. The more highly-paid positions which carry potential permanence were evaluated by the respondents in terms of their relationship to physics and the subfield of the dissertation. As expected, a high proportion of doctoral physicists work in physics-related areas and approximately half of them in the same subfield. Among the 39 respondents who assessed their initial employment as "unrelated to physics" are several in management positions, in operations research, telecommunications, and a few who are self-employed consultants.

Table IV. Factors influencing the length of postdoctoral fellowships for 1978–79 doctoral level physicists.

Characteristics		Length of 'postdoc' <1 yr.	1.5 to 2 yrs.	>2 yrs.	Total %	N
Citizenship	U.S.	35%	55%	10%	100%	145
	Foreign	43	46	11	100	40
Selected subfields of PhD	Astrophysics	39	54	7	100%	13
	Elem. particles	22	70	8	100	27
	Nuclear physics	46	38	16	100	24
	Electron, atomic & molec.	47	47	6	100	15
	Solid state	36	64	–	100	39
Plan	Specifically sought 'Postdoc' yes	36%	53%	11%	100%	135
	no	40	54	6	100	50
Total	N	67	101	17		185
	%	36	53	11	100%	

Tables IV and **V** elaborate further on the two groups in **Figure II**. With 20% more postdoctoral respondents than in the previous year, a shift toward longer fellowships was observed: only 36% as compared with 48% of the earlier fellowships are for one year or shorter duration. Also shown in **Table IV** is that 11% of those physicists who specifically sought 'postdocs', were offered fellowships for more than two years.

Table V focuses on the employers of doctoral graduates who accepted potentially permanent positions and shows that industry employs more than half of them. Academic faculty positions appear to have been offered to 28% of that group while the federal government employs most of the remaining group of graduates interested in research positions. Almost one-third of the respondents described their work activities as exclusively "research", and only 12% reported teaching large introductory physics courses at universities, or physics and other physical science courses at 4-year colleges.

Table V. Employment with potential permanence accepted by 1978–79 doctorate recipients.

		Univ.	4-yr. coll.	Industry	Gov't	FFRC	Res. inst.	N	%
Subfield of PhD	Astrophysics	2	–	3	1	4	1	11	5%
	Electron, atomic, molecular	2	2	9	5	–	–	18	8
	Elementary particles	2	–	10	1	1	–	14	6
	Nuclear	4	1	9	1	2	–	17	8
	Optics	5	1	5	3	2	–	16	7
	Plasma	8	–	9	–	6	–	23	10
	Solid state	16	7	51	4	2	1	81	36
	Other	11	2	19	9	1	2	44	20
Work activity	Teaching	16	10	–	–	–	–	26	12%
	Research	15	–	25	11	17	2	70	31
	Teaching & research	16	3	–	–	–	–	19	8
	Res. & development	3	–	36	8	–	2	49	22
	Engr. & dev.	–	–	44	4	1	–	49	22
	Management training	–	–	7	–	–	–	7	3
	Other	–	–	3	1	–	–	4	2
Physics related work	Same subfield	33	1	38	12	11	4	99	44%
	Different subfield	12	12	47	8	7	–	86	39
Unrelated to physics	Research-oriented	3	–	2	2	–	–	7	3
	New area	–	–	17	2	–	–	19	8
	Other	2	–	11	–	–	–	13	6
Total	N	50	13	115	24	18	4	224	
	%	22	6	51	11	8	2		100%

Table VI. Background characteristics and employment status of 1978–79 masters.

Characteristics		Employment full-time	Employment part-time temp., other	Unemployed and seeking		Total N	Total %
Sex	Female	65%	28%	7%	100%	14	9%
	Male	91	7	2	100	143	91
Citizenship	U.S.	89%	9%	2%	100%	145	92%
	Foreign	70	15	15	100	12	8
Age	23 or younger	85%	15%	–	100%	7	4%
	24 yrs.	91	5	4%	100	23	15
	25 yrs.	84	13	3	100	23	15
	26 yrs.	80	17	3	100	25	16
	27–28 yrs.	96	4	–	100	27	17
	29 or older	79	17	4	100	52	33
Type of institution last attended	Doctorate-granting	87%	11%	2%	100%	115	73%
	Master's-granting	90	5	5	100	42	27
Major subfields	Physics education	92%	8%	–	100%	12	8%
	Electron, atomic and molecular	75	25	–	100	9	6
	Optics	93	–	7%	100	14	9
	Solid state	77	16	7	100	45	29
	General physics	88	12	–	100	19	12
Respondents in survey	N	138	15	4		157	
	%	88	9	3			100%

When relating the characteristics of physics masters to their current occupational status, the graduate's major subfield and the citizenship appear to have some influence in securing full-time employment. The data in **Table VI** distinctly point to a demand for physics teachers, as well as graduates with applied specialties such as optics.

A closer examination of the employed masters focuses on the time spent by them to secure their initial employment. Thus **Table VII** shows that older graduates and those from master's institutions secure positions faster, and that there is a demand for teachers.

Table VII. Characteristics of 1978–79 physics masters that influence the time required to secure employment.

Characteristics		Time spent finding employment < 1 mo.	1–2 mos.	3–6 mos.	7–12 mos.	> 1 yr.	Total %	Total N
Sex	Female	29%	21%	50%	–	–	100%	14
	Male	40	23	33	3%	1%	100	136
Age	23 or younger	29%	14%	57%	–	–	100%	7
	24 yrs.	35	40	25	–	–	100	20
	25 yrs.	13	22	61	4	–	100	23
	26 yrs.	28	28	40	4	–	100	25
	27–28 yrs.	46	30	22	–	–	100	27
	29 or older	59	10	25	4	2%	100	48
Type of graduate institution	Doctorate-granting	37%	23%	37%	2%	1%	100%	110
	Master's-granting	48	25	25	2	–	100	40
Type of employment	Physics related	38%	23%	35%	3%	1%	100%	118
	Unrelated to physics	44	25	31	–	–	100	32
Major employers	Industry	28%	30%	39%	3%	–	100%	88
	Government	50	5	45	–	–	100	18
	High school	47	26	20	–	7%	100	15
	College	61	17	22	–	–	100	18
Major work activities	Teaching	55%	15%	30%	–	–	100%	27
	R & D	33	22	39	4%	2%	100	54
	Engineering	33	25	38	4	–	100	48
	Programming	27	55	18	–	–	100	11
Total resp	N	59	35	51	4	1		150
	%	39	23	34	3	1	100%	

Table VIII. Characteristics of 1978–79 physics bachelors that influence the time required to secure employment.

Characteristics		Time spent finding employment				Total	
		< 1 month	1–2 months	3–6 months	7–12 months	%	N
Sex	Female	55%	16%	24%	5%	100%	98
	Male	56	18	23	3	100	597
Age	21 or younger	67%	4%	29%	–	100%	24
	22 yrs.	53	18	26	3%	100	32
	23 yrs.	56	20	19	5	100	165
	24–25 yrs.	53	17	24	6	100	83
	26–29 yrs.	57	25	16	2	100	51
	30 or older	65	13	20	2	100	40
Type of bachelor's institution	Doctorate-granting	51%	20%	25%	4%	100%	327
	Master's-granting	55	15	27	3	100	86
	Bachelor's-granting	62	17	19	2	100	282
Type of employment	Physics related	54%	18%	25%	3%	100%	429
	Unrelated to physics	59	18	19	4	100	266
Major employer	Industry	47%	22%	27%	4%	100%	461
	High school	62	24	8	6	100	37
	University	72	16	12	–	100	31
	Government	51	16	27	6	100	57
	Military	87	1	12	–	100	77
Major work activity	Development and/or design	46%	23%	31%	–	100%	168
	Research and development	50	21	29	–	100	142
	Computer programming	49	29	22	–	100	72
	Data analysis/quality control	58	11	17	14%	100	130
	Management training	76	4	11	9	100	46
	Teaching	69	22	9	–	100	41
Total respondents	N	384	127	161	23		695
	%	55.3	18.2	23.2	3.3	100%	

The increasing demand for physics bachelors is referred to in the highlights of this report and shown in **Figure I**. **Table VIII**, similar in format to **Table VII**, has only four columns instead of five, because no one this year required more than one year to secure a position. Of the major characteristics related to the time spent securing initial employment, none appears to be very influential. On the other hand a quick movement into teaching seems to be evident, and the types of institutions bachelors attended, seem to identify the four-year physics departments as those which are more likely to have their graduates go into immediate employment than the other two types of institutions.

Two conclusions can be drawn from the age distribution shown in **Table VIII:** 1) that a rather large proportion of the graduates are 24 or older which implies either postponement or interruption in completing the bachelor's degree, and 2) that the employment experience, assumed to be the cause of that interruption, had little effect on the time spent finding post-degree employment.

Table IX. Employment of 1978–79 astronomy bachelors.

Work activity	Type of Employer: Industry	University	Other*	N	%	Median monthly salary
Astronomy related:						
Research assistant	1	3	1	5		
Data analysis	–	1	2	3		$1 000
Optical engineering	2	1	–	3	45%	13 reporting
Programming	–	–	1	1		
Teaching	–	–	1	1		
Skilled work	2	–	–	2		
Unrelated to astronomy:						
Programming	5	–	–	5		
Engineering	4	–	1	5		$1 300
Skilled (technician)	2	–	–	2	55%	16 reporting
Management training	1	–	2	3		
Teaching	1	–	–	1		
Unskilled work	2	–	–	2		
Total	20	5	8	33	100%	

*This category includes 3 graduates who entered the military service.

To make astronomy the career goal, an undergraduate astronomy major ought to know that graduate training is essential; however, almost half of the 33 astronomy bachelors presented in **Table IX** felt that they have found astronomy-related employment. The two median monthly starting salaries, included in this table are higher for those who accepted positions unrelated to astronomy because that group includes a greater number of industrial employees.

Additional publications available from the Manpower Statistics Division are:

Graduate Student Survey
Survey of Physics and Astronomy Bachelor's Degree Recipients
Survey of Enrollments and Degrees